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THE RELATION OF BIRDS TO THE ESTABLISHMENT OF LONGLEAF PINE SEEDLINGS IN SOUTHERN MISSISSIPPI

By

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The Occasional Papers of the Southern Forest Experiment Station present information on current southern forestry problems under investigation at the Station. In some cases these contributions were first presented as addresses to a limited group of people, and as "occasional papers" they can reach a much wider audience. In other cases, they are summaries of investigations prepared especially to give a report of the progress made in a particular field of research. In any case, the statements herein contained should be considered subject to correction or modification as further data are obtained.

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Introduction

The general lack of longleaf pine (Pinus palustris Miller) reproduction on much of the cut-over pinelands in the Gulf States has long been a serious problem. Even in years when the longleaf seed crop was apparently sufficient to restock through natural means, on much of the nonproductive cut-over acreage relatively few seedlings survived. This is exceedingly important because of the relative infrequency of good longleaf seed years. Although some of the seed was viable, and germinated and produced healthy vigorous seedlings where undisturbed, most of the seed disappeared after a short time. A similar lack of success has been found with seed sown artificially. A notable example was the unsuccessful attempt in 1920 by the Great Southern Lumber Company, at Bogalusa, La., to reforest 2,000 acres with longleaf pine; apparently not a single seed survived long enough to produce a seedling. In equally discouraging trials in sowing longleaf pine seed, made at McNeill, Miss., in 1928 by the Southern Forest Experiment Station, a total of 8,100 seeds planted in 81 unprotected seed plots yielded only three seedlings. Evidently either rodents or birds were responsible for the disappearance of this seed; and to determine whether the controlling factor was one or both of these agencies, field investigations were initiated by the writer in September 1935, in cooperation with the Southern Forest Experiment Station. The Harrison Experimental Forest, near Saucier, Miss. (20 miles north of Gulfport), was selected for the study as being typical of many cut-over longleaf pine areas of the central Gulf States region.

Rodents not a Factor

As a preliminary step in this study, intensive trapping was carried on to find out what rodents were present on this area, their relative abundance, and under what conditions they existed in greatest numbers. It soon became evident that both mice and rats were abnormally scarce, for surprisingly few were caught. The possibility suggested itself that this was a year of low ebb in rodent numbers, since it is now an accepted fact that these mammals have more or less definite cycles of abundance and scarcity. Repeated trapping, however, during the succeeding 2 years, has merely emphasized this extreme scarcity. It would appear, therefore, that under existing conditions rodents are not a factor in the lack of reproduction on cut-over longleaf pine lands in southern Mississippi.

Birds and Longleaf Pine Reproduction

Attention was next directed to birds as one of the probable causes of insufficient reproduction, and results are sufficiently conclusive now to

justify the assumption that birds are largely responsible for this lack of seedlings. Because certain species of birds were suspected of being guilty of the disappearance of much of the longleaf pine seed, emphasis in this study was placed on their food habits late in fall and early in winter. Sparrows, which are well-known seed-eaters, have frequently been the source of much trouble about nurseries, but an analysis of the stomach contents of 12 species of sparrows occurring on the Harrison Experimental Forest during this interval showed that they could be entirely disregarded in this study; only rarely were fragments of pine seed included in the food eaten, since its size probably renders it undesirable to such species. Robins (Turdus migratorius Linnaeus) have acquired the reputation of eating considerable pine seed during the winter, but both observation and the examination of stomach contents proved this accusation to be unfounded. Without exception, tree seeds eaten by robins came from fleshy fruits such as the dogwood and the black gum. Flocks of robins encountered in the pine woods may appear to the casual observer to be eating pine seed, but if they are watched for any length of time they are generally found to be interested mainly in gallberries (Ilex glabra A. Gray), an unfailing source of food in such a situation.

Other birds, however, were not so innocent, as the following data attest. In order of their abundance, the species showing a decided preference for longleaf pine seed late in fall and early in winter were the southern meadowlark (Sturnella magna argutula Bans), the mourning dove (Zenaidura macroura carolinensis Linnaeus), the bobwhite (Colinus virginianus Linnaeus), and four species of blackbirds--the cowbird (Molothrus ater Boddaert), the rusty blackbird (Euphagus carolinus Muller), Brewer's blackbird (Euphagus cyanocephalus Wagler), and the red-winged blackbird (Agelaius phoeniceus Linnaeus).

It was expected that the number of meadowlarks present during the winter would be materially increased by the appearance of flocks of migrants from the North, but this did not prove to be the case. No specimens taken could be referred to the northern race, all flocks observed being unquestionably composed of individuals resident in southern Mississippi. Although the first longleaf pine seed began to fall during the latter part of October, it was not until the first touch of cold weather several weeks later that more than a trace of pine seed was found in the contents of meadowlark stomachs examined. Insects (notably grasshoppers) formed the major portion of the food eaten until low temperatures resulted in their sudden scarcity, after which pine seed was consumed in increasing quantities. This relationship between inclement weather and food preference was so consistent throughout the winter of 1935-36 that it is entirely probable that in mild winters meadowlarks do far less damage than they did during this first year of the study. After the middle of November, few stomachs were examined that did not hold at least a few fragments of pine seed, but not until after a sudden drop in temperature, followed by rain and high winds, did pine seed form 75 percent or more of the total food consumed.

Mourning doves proved to be consistent eaters of longleaf pine seed, and although less numerous than the meadowlarks, they were probably more destructive. A male bird--a typical example--taken on November 12, 1935, had nine whole seeds in its crop and two partially digested ones in its stomach. Bobwhites also destroyed many seeds, for the few stomachs of this species

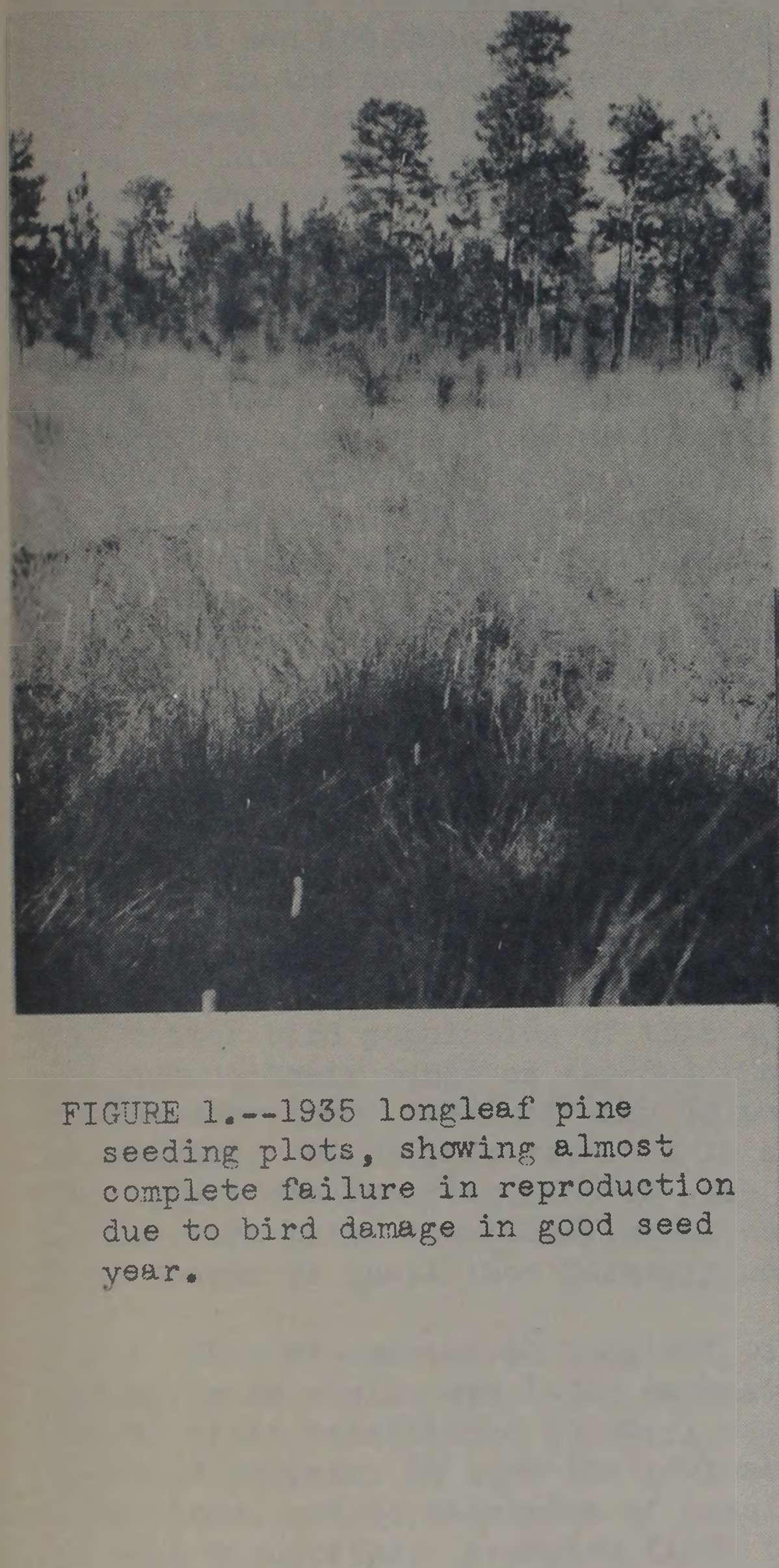

FIGURE 1.--1935 longleaf pine seeding plots, showing almost complete failure in reproduction due to bird damage in good seed year.

FIGURE 2.--1936 longleaf pine seeding experiment, in off seed year. Note good reproduction and no bird damage.

analyzed in December 1935 were found crammed with pine seeds to the practical exclusion of all other food.

In 1935, not until early in December did the first flocks of blackbirds appear in southern Mississippi, but their numbers and their voracious appetites make them an important factor in limiting longleaf pine reproduction. It was not uncommon to find 200 or more individuals (of two or three species) in the restless flocks that were encountered daily. In feeding they showed a marked preference for burned areas; although seen about land under cultivation, they were never observed in the unburned "roughs." Obviously they would have experienced little difficulty in procuring food even where the grass was thickest, but rarely, if ever, did they feed under such conditions. Examination of the contents of the stomachs showed that pine seed was always eaten when it was available, but since other seeds and insects were never left untouched, the pine seed rarely exceeded 50 percent of the total food eaten. This was sufficient, however, for the birds to prevent the development of most seedlings on any area in which they were feeding, for they invariably remained in compact flocks that overlooked little material acceptable as food. After the seed had germinated, it was still in danger of being severely injured, if not destroyed, for the endosperm and seed coat clinging to the cotyledons were as acceptable as the seed itself. In this connection it was interesting to compare the damage done by the blackbirds with that done by the meadowlarks late in winter. When taking the endosperm with their short, conical bills, the blackbirds merely clipped off the tips of the cotyledons; whereas the meadowlarks, having relatively long, stout bills, tended to cut off the entire seedling near the root collar.

In 1935 there was a very heavy longleaf pine seed crop, in marked contrast with the fall of 1936, when practically no longleaf pine seed was produced in southern Mississippi. This affected almost immediately the normal winter bird population of this area. Meadowlarks, normally resident throughout their range on the Gulf Coast, gradually decreased, until early in December there remained only 10 percent of the number present the preceding winter. Blackbirds appeared in small flocks that lingered but a day or two before disappearing. Doves were far from plentiful, the scattered flocks seen being invariably about cultivated fields. The same was true of many coveys of quail that formerly could be found in the open pine woods.

This dependence on longleaf pine seed as a source of food late in fall and early in winter was later emphasized by the results obtained on experimental areas established to check seed survival. These experiments had a two-fold purpose: To test the advisability of direct seeding under existing conditions, and to determine if possible what method of direct seeding would be most successful. Accepted field technique was used in varying the actual seeding. Part of the seed was merely broadcast and not covered; another part was broadcast and covered with a light mulch of pine "straw"; and still another part was planted in drills to a depth of approximately a quarter inch. Each of these methods was further tested by varying the ground cover. A third of each plot remained in the natural "rough," another third was burned just prior to sowing, and the remainder was cultivated.

After one year, the plots established early in December 1935 showed clearly the scarcity of rodents as well as the actual effect of birds on

longleaf pine regeneration. Where the seed was covered with a light mulch or planted in drills, germination was unhampered, indicating that rodents were not present in any numbers. Almost at once, however, damage by birds was clearly evident in the injury or total disappearance of the seedlings; the presence of the endosperm and seed cap resulted in the survival of only an occasional seedling that apparently had been overlooked. Seed left uncovered disappeared within 1 or 2 days. A careful check of these plots a year later showed a survival of less than 1 percent, leaving little doubt of the inadvisability of attempting direct seeding under the existing conditions.

The second year of the study (fall of 1936), when the cone crop was practically nonexistent and birds were scarce, radically different results were obtained on two series of plots established similarly to those in 1935. On one series (A, table 1), on a cut-over area adjacent to trees that had borne a good crop of cones the previous year, the seed was practically untouched; seed germination and survival of the seedlings were satisfactory beyond the most sanguine expectations. Another series (B, table 1) was intentionally placed under the most adverse conditions that could be found on the experimental forest--within a short distance of a site used the previous year, where damage by birds had been rather severe. Nevertheless, the survival here, despite the activities of four meadowlarks that appeared before all the seed had germinated, was sufficiently large to justify direct seeding under existing conditions.

Table 1.- Survival of longleaf pine seed sown late in December 1936

Plot treatment	Series	Percentage survival of 350 seeds sown		
		In drills	Broadcast and exposed	Covered with a light mulch
Natural rough	A 1/	97	91	3/ 16
	B 2/	15	33	34
Cultivated	A	96	77	76
	B	17	41	16
Burned	A	83	60	51
	B	35	17	13

1/ In Series A loss in many cases was due to damaged and infertile seed, or to factors other than birds and rodents.

2/ In Series B loss of seed and destruction of seedlings were caused chiefly by the activities of meadowlarks.

3/ Low survival was due to activities of several harvest mice (Reithrodontomys).

Summary and Conclusions

The following conclusions seem warranted by results of field investigations carried on during approximately 2 years on the Harrison Experimental Forest in southern Mississippi.

1. Under present conditions, in the locality studied, rodents are not an important factor in the success or failure of longleaf pine reproduction.

2. Certain birds, including the southern meadowlark, the mourning dove, four species of blackbirds (the cowbird, the rusty blackbird, Brewer's blackbird, and the red-winged blackbird), and the bobwhite, are responsible for the disappearance of a large part of the annual seed crop of the longleaf pine.

3. These birds depend to such an extent on this source of food late in fall and early in winter that their movements are largely governed at these seasons by the quantity of longleaf pine seed produced.

4. Because of this dependence on longleaf pine seed, obtaining natural reproduction will always be difficult, and unless aided by planting, will require many years.

5. Direct seeding should not be undertaken during years when seed is produced in abundance. Maximum natural survival can apparently be obtained when the cone crop is light and birds are relatively scarce. Best results from direct seeding can also be expected during such years.

It should be emphasized, however, that these conclusions apply only to cut-over longleaf pine lands in southern Mississippi. Before it is possible to recommend any general practices throughout the range of the longleaf pine, studies similar to this should be carried on in other southern States, such as Texas, Alabama, Georgia, and Florida, where undoubtedly local conditions will be found to have a direct bearing on the problem of natural regeneration of longleaf pine.